Sughrue
SUGHRUE MION ZINN MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, NW
Washington, DC 20037-3213
T 202.293.7060
F 202.293.7860
www.sughrue.com

June 28, 2001

BOX PCT

Commissioner for Patents
Washington, D.C. 20231

PCT/JP99/05458
-filed October 4, 1999

Re: Application of Ryoichi FUKAGAWA, Ryuji IWAKIRI (deceased), Keisuke TANO, Daisuke TANIZAWA and Nobuhiko TSUDA
FLUORINE-CONTAINING RESIN POWDER COATING COMPOSITION HAVING EXCELLENT PROPERTY FOR PROTECTING SUBSTRATE
Assignee: DAIKIN INDUSTRIES, LTD.
Our Ref: Q65022

Dear Sir:

The following documents and fees are submitted herewith in connection with the above application for the purpose of entering the National stage under 35 U.S.C. § 371 and in accordance with Chapter II of the Patent Cooperation Treaty:

- ☑ an executed Declaration and Power of Attorney.
- ☑ an English translation of the International Application.
- ☑ an International Preliminary Examination Report (foreign language).
- ☑ an executed Assignment and PTO 1595 form.
- ☑ a Form PTO-1449 listing the ISR references, and a complete copy of each reference.
- ☑ a Preliminary Amendment.

It is assumed that copies of the International Application, the International Search Report, the International Preliminary Examination Report, and any Articles 19 and 34 amendments as required by § 371(c) will be supplied directly by the International Bureau, but if further copies are needed, the undersigned can easily provide them upon request.

Assignment for published patent application is: **DAIKIN INDUSTRIES, LTD.**.

The Government filing fee, after entry of the Preliminary Amendment, is calculated as follows:

Total claims	8	-	20	=		x $18.00	= $.00
Independent claims	2	-	3	=		x $80.00	= $.00
Base Fee							$860.00
TOTAL FILING FEE							$860.00
Recordation of Assignment							$ 40.00
TOTAL FEE							$900.00

Sughrue
SUGHRUE MION ZINN MACPEAK & SEAS, PLLC

09/869342
JC18 Rec'd PCT/PTO 28 JUN 2001

Checks for the statutory filing fee of $860.00 and Assignment recordation fee of $40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.492 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

There is no claim to priority.

Respectfully submitted,

Abraham J. Rosner
Registration No. 33,276

SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

Date: June 28, 2001

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Ryoichi FUKAGAWA, et al.

PCT/JP99/05458

Appln. No.: Unassigned

Group Art Unit: Unassigned

Confirmation No.: Unassigned

Examiner: Unassigned

Filed: June 28, 2000

For: FLUORINE-CONTAINING RESIN POWDER COATING COMPOSITION HAVING EXCELLENT PROPERTY FOR PROTECTING SUBSTRATE

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE CLAIMS:

Please enter the following amended claims:

3. (Amended) The thermosetting fluorine-containing resin powder coating composition of Claim 1, wherein an average particle size of said fine powder of silicon oxide is 1/1,000 or less of an average particle size of the powder of fluorine-containing resin powder coating composition.

4. (Amended) The thermosetting fluorine-containing resin powder coating composition of Claim 1, wherein the powder of fluorine-containing resin powder coating composition is a powder obtained by pulverizing a melt-kneaded product of a fluorine-containing resin and a curing agent.

7. (Amended) The preparation process of Claim 5, wherein an average particle size of said fine particles of silicon oxide is 1/1,000 or less of an average particle size of the powder of fluorine-containing resin powder coating composition.

8. (Amended) A coated article obtained by applying the thermosetting fluorine-containing resin powder coating composition of Claim 1 on a metallic substrate.

REMARKS

Entry and consideration of this Amendment is respectfully requested.

Respectfully submitted,

Abraham J. Rosner
Registration No. 33,276

SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

Date: June 28, 2001

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

3. (Amended) The thermosetting fluorine-containing resin powder coating composition of ~~Claim 1 or 2~~ Claim 1, wherein an average particle size of said fine powder of silicon oxide is 1/1,000 or less of an average particle size of the powder of fluorine-containing resin powder coating composition.

4. (Amended) The thermosetting fluorine-containing resin powder coating composition of ~~any of Claims 1 to 3~~ Claim 1, wherein the powder of fluorine-containing resin powder coating composition is a powder obtained by pulverizing a melt-kneaded product of a fluorine-containing resin and a curing agent.

7. (Amended) The preparation process of ~~Claim 5 or 6~~ Claim 5, wherein an average particle size of said fine particles of silicon oxide is 1/1,000 or less of an average particle size of the powder of fluorine-containing resin powder coating composition.

8. (Amended) A coated article obtained by applying the thermosetting fluorine-containing resin powder coating composition of ~~any of Claims 1 to 4~~ Claim 1 on a metallic substrate.

DESCRIPTION

FLUORINE-CONTAINING RESIN POWDER COATING COMPOSITION HAVING EXCELLENT PROPERTY FOR PROTECTING SUBSTRATE

TECHNICAL FIELD

The present invention relates to a thermosetting fluorine-containing resin powder coating composition being excellent in a property for protecting a substrate, particularly a metallic substrate.

BACKGROUND ART

As a resin for a thermosetting powder coating composition, an epoxy resin, acrylic resin and polyester resin have been mainly used.

Also in order to improve weather resistance of general-purpose resins for powder coating compositions, there are proposals that a thermosetting fluorine-containing resin is used as a resin for a powder coating composition (JP-B-6-104792, JP-A-6-345822).

However when the thermosetting fluorine-containing resin powder coating composition is applied on a metallic substrate, there is no problem with weather resistance of the fluorine-containing resin coating film. However, for example, when the coating film is exposed outdoor for a long period of time, deterioration of the metallic substrate advances and corrosion thereof arises mainly due to rust. This phenomenon has not been recognized in case of general-purpose powder coating compositions being inferior in weather resistance and appears remarkably in case of a thermosetting fluorine-containing resin powder coating composition, particularly in case where the composition is

coated by an electrostatic powder coating method.

The inventors of the present invention have found that when mixing a silicon oxide powder having a specific relation with a fluorine-containing resin powder, a thermosetting fluorine-containing resin powder coating composition being excellent in a property for protecting a substrate, particularly a metallic substrate can be provided.

It is known that since an expensive fluorine-containing resin is used for the thermosetting fluorine-containing resin powder coating composition, in order to increase a volume of the coating composition, powders such as a filler and silicon oxide as a pigment are blended to the composition (JP-B-6-104792, JP-A-6-345822mentioned above). However a particle size thereof is relatively large, and an effect of protecting a substrate cannot be obtained as mentioned hereinafter.

Also there is a proposal that a silicon oxide powder having an average particle size of not more than 50 μm (nm) is blended to general-purpose powder coating compositions (JP-A-51-42731). However in that publication, there is only a description that a flowability of the powder coating composition at fluidized bed coating and spray coating is improved but there is no recognition at all about not only thermosetting fluorine-containing resin powder coating composition but also a problem with the above-mentioned protection of a substrate.

DISCLOSURE OF INVENTION

Namely the present invention relates to the thermosetting fluorine-containing resin powder coating composition prepared by mixing a fine powder of silicon oxide having an average particle size of 1/100 or less of an average particle size of the powder of fluorine-

containing resin powder coating composition.

It is preferable that a mixing amount of the silicon oxide fine powder is from 0.01 to 5 parts by weight (hereinafter referred to as "part") based on 100 parts of the powder of fluorine-containing resin powder coating composition.

The thermosetting fluorine-containing resin powder coating composition of the present invention can be prepared by melt-kneading a fluorine-containing resin and a curing agent and then pulverizing, and at the time of pulverization or after pulverization, a fine powder of silicon oxide having an average particle size of 1/100 or less of an average particle size of the powder of fluorine-containing resin powder coating composition is mixed to the composition.

Also the present invention relates to the coated article obtained by coating the thermosetting fluorine-containing resin powder coating composition on a metallic substrate.

BEST MODE FOR CARRYING OUT THE INVENTION

The powder of thermosetting fluorine-containing resin powder coating composition to be used in the present invention basically comprises a thermosetting fluorine-containing resin powder, a curing agent, the above-mentioned fine powder of silicon oxide and as case demands, additives such as a pigment.

The thermosetting fluorine-containing resin as a resin component is not limited particularly as far as it is a polymer having a fluorine-containing monomer unit and a crosslinkable reactive group as the essential components.

Examples of the fluorine-containing monomer are, for

instance, one or two or more of tetrafluoroethylene, chlorotrifluoroethylene, trifluoroethylene, vinylidene fluoride, hexafluoropropylene, pentafluoropropylene, perfluoro(vinyl ether), monofluoroethylene, and the like. Further if necessary, non-fluorine-containing monomer may be copolymerized.

Examples of the crosslinkable reactive group are, for instance, hydroxyl group, carboxyl group, amino group, amido group, glycidyl group, isocyanate group, halogen atoms such as bromine and iodine, and the like.

As case demands, in addition to the thermosetting fluorine-containing resin, the above-mentioned general-purpose non-fluorine-containing thermosetting resin such as an epoxy resin, acrylic resin or polyester resin may be blended as a powder resin component.

As the curing agent, those which have been used for thermosetting powder coating compositions can be used. For example, there are a blocked isocyanate compound, acid anhydride, polyamine compound, glycidyl compound, isocyanurate compound, polybasic acid, and the like.

Further various additives which have been usually used for a powder coating composition, for example, a pigment, filler, ultraviolet ray absorber, leveling agent, flowability control agent, antioxidant, heat deterioration preventing agent, gloss control agent, electric charge control agent, and the like may be optionally blended.

Examples of the powder of thermosetting fluorine-containing resin powder coating composition which can be used in the present invention are, for instance, powders of coating compositions prepared from thermosetting fluorine-containing resins described in JP-B-6-

104792, JP-A-5-331388, Japanese Patent No. 2782726, etc.

In the present invention the powder of thermosetting fluorine-containing resin powder coating composition to which the fine powder of silicon oxide is blended (hereinafter in some cases referred to as "powder of coating composition") is a powder obtained by mixing a curing agent and as case demands, a pigment and other additives to the thermosetting fluorine-containing resin, melt-kneading the mixture and then pulverizing the obtained melt-kneaded product. An average particle size of the obtained powder is usually from 1 to 150 μm, preferably about 10 μm to about 50 μm. Also as mentioned hereinafter, the fine powder of silicon oxide may be mixed to the fluorine-containing resin and curing agent before melt-kneading, and after the melt-kneading, pulverizing may be carried out.

The silicon oxide fine powder to be blended to the powder of coating composition is one having an average particle size smaller than that of the powder of coating composition.

Though a function of the fine powders of silicon oxide in the present invention is not clear, since an effect thereof is larger when the fine powder is adhered to a surface of the powder particle of coating composition than when the fine powder is mixed to the powder of coating composition, it can be presumed that electric discharging which arises inevitably at coating, particularly at electrostatic coating in case of a fluorine-containing resin having a higher charging property than general-purpose resins can be effectively inhibited by adhering the fine powders of silicon oxide to the surface of the powder particles of coating composition, thereby preventing a pin hole from arising on a coating film and as a result, an ability for protecting a substrate can be enhanced

more.

Therefore though as mentioned above, the fine powders of silicon oxide may be melt-kneaded together with the thermosetting fluorine-containing resin, curing agent, etc. and then pulverized, from the viewpoint of being capable of adhering the fine powders effectively and uniformly on the surfaces of particles of powder of coating composition, it is preferable to mix the fine powders at the time when pulverizing a melt-kneaded product produced from the thermosetting fluorine-containing resin, curing agent, etc. or after the pulverization.

A mixing amount of the fine powders of silicon oxide is from 0.01 to 5 parts, preferably 0.02 to 3 parts, more preferably 0.03 to 1 part, particularly preferably 0.05 to 0.5 part based on 100 parts of powders of the thermosetting fluorine-containing resin powder coating composition. When the mixing amount is too large, a coating film becomes turbid and a gloss is lowered. When the mixing amount is too small, an effect of protecting a substrate cannot be obtained.

It is preferable that the fine powders of silicon oxide are those having an average particle size of not more than 1/100, further not more than 1/1,000, particularly 1/3,000 to 1/10,000 of that of particles of the powder of coating composition. Concretely there are fine particles of silicon oxide having an average particle size of from about 5 nm to about 500 nm, further 5 to 50 nm. Further from the viewpoint of excellent storage stability of the powder coating composition, preferable are fine particles of silicon oxide having a pH value in an acid range of from 3 to 7 in case of a 4 % aqueous dispersion thereof. Also from the viewpoint of good affinity for the fluorine-containing resin, those having hydrophobic property are preferable. Also those containing a slight

amount of impurities, for example, metal oxide such as aluminum oxide, iron oxide or titanium oxide may be used.

Examples of a substrate which is expected to be protected by the powder coating composition of the present invention are metallic substrates made of aluminum, stainless steel, copper, cold rolled steel plate, zinc plated steel plate, and the like, substrates made of plastic and rubber and substrates made of natural material such as wood or stone. The present invention is most suitable for protection of metallic substrates, particularly substrates of stainless steel and various steel plates which have a big problem with corrosion due to rusting.

Though various coating methods which have been used for coating of powder coating composition can be used, an effect of the present invention can be expected most in electrostatic coating in which there is a problem particularly with occurrence of a pin hole. Coating conditions may be the same as in usual coating.

Non-restricted examples of products obtained by coating the thermosetting fluorine-containing resin powder coating composition of the present invention are, for instance, those raised below.

Building material:

Aluminum sash, fence, gate, balcony, handrail, grating, shutter, door and terrace

Domestic goods and appliances (electric appliances, etc.):

Basket, pan, various cleaning utensils, range, range hood, air conditioning facilities, cooler/heater equipment, washing machine, ventilator and sewing machine

Safety utensils:

Fire hydrant, fire fighting facilities, pole for fire hydrant,

safety net for prevention of falling and safety shoes

Aircraft:

Exterior of aircraft

Vessel:

Outboard equipment, screw, raider and bottom plating

Vehicle (automobile, train, etc.):

Exterior and interior of vehicle body, wiper, bumper, wheel, pipe, brake, sunroof, grip of door, shift lever, drive shaft, joint of rails, bolt and nut

Other metallic products:

Bomb, drum, pail, brewing tank, container, desk, chair, various interior parts and decorations of furniture

Then the present invention is explained by means of examples, but is not limited to them.

EXAMPLE 1

(Preparation of thermosetting fluorine-containing resin powder coating composition)

A chlorotrifluoroethylene/cyclohexyl vinyl ether/isobutyl vinyl ether/hydroxybutyl vinyl ether (weight ratio: about 50/16/9/25) coplymer (hydroxyl value: 120 mgKOH/g, glass transition temperature: 45°C, weight reduction by heating: not more than 2 % by weight, intrinsic viscosity [η] measured at 30°C in tetrahydrofuran: 0.21) was pulverized with an impact hammer mill to give a thermosetting fluorine-containing resin powder. After 44 parts of the fluorine-containing resin powder, 30 parts of a pigment (titanium dioxide) and 26 parts of a curing agent (ADDUCT B-1530 available from Hűls Co., Ltd.)

were uniformly mixed for about one minute with a dry blender (Henschel mixer available from Mitsui Kako Kikai Kabushiki Kaisha), the mixture was melt-kneaded at a temperature of from 80° to 100°C with an extrusion kneader (Buss Co-kneader PR-46 available from Buss Co., Ltd.), and after cooling, the kneaded product was finely pulverized with an impact hammer mill. Further coarse particles were removed through a 150 mesh metal net to give a powder of thermosetting fluorine-containing resin powder coating composition to be used in Examples (average particle size: 35 μm).

(Mixing of fine powder of silicon oxide)

To 100 g of the obtained powder of thermosetting fluorine-containing resin powder coating composition was added 0.07 g of hydrophobic fine powder of silicon oxide having an average particle size of 7 nm (AEROSIL 380 available from Nippon Aerosil Co., Ltd., pH value in case of 4 % aqueous dispersion thereof: 4), followed by dry blending with the above-mentioned dry blender for 15 minutes to give the thermosetting fluorine-containing resin powder coating composition of the present invention.

(Test for protection of substrate)

The obtained thermosetting fluorine-containing resin powder coating composition was applied on a stainless steel plate (SUS304) subjected to chromate treatment in a thickness of 0.03 mm by electrostatic coating at an applied voltage of 60 kV with a corona discharge powder coating gun (GX33000 available from Onoda Cement Kabushiki Kaisha), followed by baking at 200°C for 15 minutes to give a coated test plate.

The following characteristics were evaluated by using the

coated plate. The results are shown in Table 1.

Appearance of coating film

A surface of the coating film of the obtained coated plate was observed with naked eyes, and evaluation was made particularly with respect to smoothness (unevenness) and a pin hole of the surface.

Weather resistance

The obtained coated plate was exposed outdoor for two years in Miyakojima Island of Okinawa-ken, and a state of a surface of coating film and a state of a substrate before and after the exposure were observed with naked eyes. Criteria for evaluation was as mentioned below.

A: No change in both of coating film and substrate.

B: White spots (change in color) on the coating film, but no change on the substrate.

C: White spots (change in color) on the coating film and partly rusting (filiform rusting).

D: White spots (change in color) widely on the coating film and rusting on the whole surface of the substrate.

EXAMPLES 2 to 3

Thermosetting fluorine-containing resin powder coating compositions of the present invention were prepared in the same manner as in Example 1 except that a fine powder of silicon oxide having an average particle size of 12 nm (AEROSIL 200 available from Nippon Aerosil Co., Ltd., Example 2) and a fine powder of silicon oxide having an average particle size of 100 nm (pulverized molten silica, Example 3) were used as the fine powder of silicon oxide, and then coated test plates

were produced. Characteristics of the coated plates were evaluated in the same manner as in Example 1. The results are shown in Table 1.

EXAMPLE 4

0.07 Gram of silicon oxide fine powders having an average particle size of 7 nm (the above-mentioned AEROSIL 380) was dry-blended with the same fluorine-containing resin, pigment (titanium dioxide) and curing agent (amounts thereof were also the same) as used in Example 1, followed by melt-kneading, pulverizing and sieving to give a thermosetting fluorine-containing resin powder coating composition having an average particle size of 35 μm.

A coated plate was produced in the same manner as in Example 1 by using the obtained powder coating composition, and characteristics thereof were evaluated. The results are shown in Table 1.

COMPARATIVE EXAMPLE 1

A thermosetting fluorine-containing resin powder coating composition for comparison was prepared in the same manner as in Example 1 except that a fine powder of silicon oxide was not used.

A coated plate was produced in the same manner as in Example 1 by using the obtained powder coating composition, and characteristics thereof were evaluated. The results are shown in Table 1.

COMPARATIVE EXAMPLE 2

A thermosetting fluorine-containing resin powder coating

composition for comparison was prepared in the same manner as in Example 1 except that a powder of silicon oxide having an average particle size of 40,000 nm (pulverized molten silica) was used as a silicon oxide powder.

A coated plate was produced in the same manner as in Example 1 by using the obtained powder coating composition, and characteristics thereof were evaluated. The results are shown in Table 1.

COMPARATIVE EXAMPLE 3

A thermosetting epoxy resin powder coating composition for comparison was prepared in the same manner as in Example 1 except that an epoxy resin (EPICOAT 1004 available from Shell Chemical Co., Ltd.) was used as a resin for powder coating composition and EPICURE 108FF available from Shell Chemical Co., Ltd. was used as a curing agent.

A coated plate was produced in the same manner as in Example 1 by using the obtained powder coating composition, and characteristics thereof were evaluated. The results are shown in Table 1.

TABLE 1

	Average particle size of silicon oxide powder (nm)	Timing of mixing of silicon oxide powder	Appearance of coating film (before weather resistance test)	Weather resistance test
Ex. 1	7	After pulverization	Good	A
Ex. 2	12	After pulverization	Good	B
Ex. 3	100	After pulverization	Good	C
Ex. 4	7	Before melt-kneading	Good	C
Com. Ex. 1	-	-	Small pin holes were generated	D
Com. Ex. 2	40000	After pulverization	Good	D
Com. Ex. 3	7	After pulverization	Good	D

As it is clear from Table 1, it can be recognized that the thermosetting fluorine-containing resin powder coating composition prepared by mixing a fine powder of silicon oxide is excellent in weather resistance and exhibits a protective effect of a substrate. Particularly by mixing the fine powder of silicon oxide to the powder of coating composition after pulverization, it can be recognized that an ability of protecting a substrate is enhanced. Also when a general-purpose epoxy resin is used, weather resistance is inferior and the substrate is greatly influenced.

INDUSTRIAL APPLICABILITY

The thermosetting fluorine-containing resin powder coating composition of the present invention can be used as a coating composition in various fields where weather resistance is required and a substrate can be protected sufficiently.

CLAIMS

1. A thermosetting fluorine-containing resin powder coating composition prepared by mixing a fine powder of silicon oxide having an average particle size of 1/100 or less of an average particle size of a powder of fluorine-containing resin powder coating composition.

2. The thermosetting fluorine-containing resin powder coating composition of Claim 1, which is prepared by mixing 0.01 to 5 parts by weight of said fine powder of silicon oxide based on 100 parts by weight of the powder of fluorine-containing resin powder coating composition.

3. The thermosetting fluorine-containing resin powder coating composition of Claim 1 or 2, wherein an average particle size of said fine powder of silicon oxide is 1/1,000 or less of an average particle size of the powder of fluorine-containing resin powder coating composition.

4. The thermosetting fluorine-containing resin powder coating composition of any of Claims 1 to 3, wherein the powder of fluorine-containing resin powder coating composition is a powder obtained by pulverizing a melt-kneaded product of a fluorine-containing resin and a curing agent.

5. A process of preparing a thermosetting fluorine-containing resin powder coating composition by melt-kneading a fluorine-

containing resin and a curing agent and pulverizing, in which when pulverizing or after pulverizing, a fine powder of silicon oxide having an average particle size of 1/100 or less of an average particle size of a powder of fluorine-containing resin powder coating composition is mixed.

6. The preparation process of Claim 5, wherein 0.01 to 5 parts by weight of said fine powder of silicon oxide is mixed based on 100 parts by weight of the powder of fluorine-containing resin powder coating composition.

7. The preparation process of Claim 5 or 6, wherein an average particle size of said fine particles of silicon oxide is 1/1,000 or less of an average particle size of the powder of fluorine-containing resin powder coating composition.

8. A coated article obtained by applying the thermosetting fluorine-containing resin powder coating composition of any of Claims 1 to 4 on a metallic substrate.

Declaration and Power of Attorney for Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

私は、以下に記名された発明者として、ここに下記の通り宣言する。

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先及び国籍は、私の氏名の後に記載された通りである。

My residence, post office address and citizenship are as stated next to my name,

下記の名称の発明について、特許請求範囲に記載され、且つ特許が求められている発明主題に関して、私は、最初、最先且つ唯一の発明者である(唯一の氏名が記載されている場合)か、或いは最初、最先且つ共同発明者である(複数の氏名が記載されている場合)と信じている。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

FLUORINE-CONTAINING RESIN POWDER COATING COMPOSITION HAVING EXCELLENT PROPERTY FOR PROTECTING SUBSTRATE

上記発明の明細書はここに添付されているが、下記の欄がX印でチェックされている場合は、この限りでない:

the specification of which is attached hereto unless the following box is checked:

☐ ____月____日に出願され、PCT国際出願番号を ____ とし、かつ ____月____日に出願された米国出願番号は____ であり、____月____日に補正された出願(該当する場合)

☐ was filed on ____ as PCT International Application No. ____ and subsequently on ____ as United States Application No. ____ and was amended on ____ (if applicable).

私は、上記の補正書によって補正された特許請求範囲を含む上記明細書を検討し、且つ内容を理解していることをここに表明する。

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37編1.56に定義されている特許性について重要な情報を開示する義務があることを認める。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration

（日本語宣言書）

私は、ここに、下記に記載した外国での特許出願または発明者証の出願、或いは米国以外の少なくとも一カ国を指定している米国法典第35編365条(a)項によるPCT国際出願について、同第119条(a)-(d)項又は第365条(b)項に基づいて優先権を主張するとともに、優先権を主張する本出願の出願日よりも前の出願日を有する外国での特許出願または発明者証の出願、或いはPCT国際出願については、いかなる出願も、下記の枠内をチェックすることにより示した。

I hereby claim foreign priority under Title 35, United States Code, Section 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Applications 外国での先行出願			Priority Claimed 優先権の主張
(Number) （番号）	(Country) （国名）	(Day/Month/Year Filed) （出願日/月/年）	☐ YES あり ☐ NO なし
(Number) （番号）	(Country) （国名）	(Day/Month/Year Filed) （出願年月日）	☐ YES あり ☐ NO なし
(Number) （番号）	(Country) （国名）	(Day/Month/Year Filed) （出願年月日）	☐ YES あり ☐ NO なし

私は、ここに、下記のいかなる米国仮特許出願についても、その米国法典第35編119条(e)項の利益を主張する。

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.) （出願番号）	(Filing Date) （出願日）	(Application No.) （出願番号）	(Filing Date) （出願日）

私は、ここに、下記のいかなる米国出願についても、その米国法典第35編第120条に基づく利益を主張し、また米国を指定するいかなるPCT国際出願についても、その同第365条(c)に基づく利益を主張する。また、本出願の各特許請求の範囲の主題が、米国法典第35編第112条第1段に規定された態様で、先行する米国出願またはPCT国際出願に開示されていない場合においては、その先行出願の出願日と本国内出願日またはPCT国際出願日との間の期間中に入手された情報で、連邦規則法典第37編規則1.56に定義された特許性に関わる重要な情報について開示義務があることを承認する。

I hereby claim the benefit of Title 35, United States Code Section 120 of any United States application(s), or 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose any material information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application No.) （出願番号）	(Filing Date) （出願日）	(Status: Patented, Pending, Abandoned) （現況：特許許可済、係属中、放棄済）

私は、ここに表明された私自身の知識にかかわる陳述が真実であり、且つ情報と信ずることに基づく陳述が、真実であると信じられることを宣言し、さらに、故意に虚偽の陳述などを行った場合は、米国法典第18編第1001条に基づき、罰金または拘禁、もしくはその両方により処罰され、またそのような故意による虚偽の陳述は、本出願またはそれに対して発行されるいかなる特許も、その有効性に問題が生ずることを理解した上で、陳述が行われたことを、ここに宣言する。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration

（日本語宣言書）

委任状：私は、本出願を審査する手続きを行い、且つ米国特許商標庁との全ての業務を遂行するために、記名された発明者として、下記の弁護士及び/または弁理士を任命する。（氏名及び登録番号を記載すること）

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (*list name and registration number)*

John H. Mion, Reg. No. 18,879; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; Brett S. Sylvester, Reg. No. 32,765; Robert M. Masters, Reg. No. 35,603; George F. Lehnigk, Reg. No. 36,359; John T. Callahan, Reg. No. 32,607; Steven M. Gruskin, Reg. No. 36,818; Peter A. McKenna, Reg. 38,551 and Edward F. Kenehan, Jr., Reg. 28,962

34

書類送付先：

Send Correspondence to:

SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037-3213

直通電話連絡先：（名称及び電話番号）

Direct Telephone Calls to: ***(name and telephone number)***

(202)293-7060

Full name of sole or first inventor 唯一又は第一発明者名	Ryoichi FUKAGAWA
Inventor's signature 発明者の署名	Ryoichi Fukagawa Date 日付 June 6, 2001
Residence 住所	Settsu-shi, OSAKA 566-8585 JAPAN JPX
Citizenship 国籍	Japanese
Post office address 郵便の宛先	c/o Yodogawa-seisakusho, DAIKIN INDUSTRIES, LTD. 1-1, Nishihitotsuya, Settsu-shi, OSAKA 566-8585 JAPAN
Full name of second joint inventor, if any 第二共同発明者名（該当する場合）	Ryuji IWAKIRI (deceased) 11-01
Second inventor's signature 第二発明者の署名	MIYUKI IWAKIRI Date 日付 June 6, 2001 JPX by Miyuki Iwakiri, as Legal Representative of Ryuji Iwakiri, Deceased
Residence 住所	Residence of Miyuki Iwakiri: Minoo-shi, OSAKA 562-0005 JAPAN Residence of Ryuji Iwakiri (deceased): Settsu-shi, OSAKA 566-8585 JAPAN
Citizenship 国籍	Citizenship of Miyuki Iwakiri: Japanese Citizenship of Ryuji Iwakiri (deceased): Japanese
Post office address 郵便の宛先	Post office address of Miyuki Iwakiri: 11-31-102, Niina 4-chome, Minoo-shi, OSAKA 562-0005 JAPAN Post office address of Ryuji Iwakiri (deceased): c/o Yodogawa-seisakusho, DAIKIN INDUSTRIES, LTD. 1-1, Nishihitotsuya, Settsu-shi, OSAKA 566-8585 JAPAN

（第三以降の共同発明者についても同様に記載し、署名をすること。）

(Supply similar information and signature for third and subsequent joint inventors.)

Japanese Language Declaration
(日本語宣言書)

Full name of third joint inventor, if any 第三共同発明者名(該当する場合)	Keisuke TANO
Third inventor's signature 第三発明者の署名	Keisuke Tano Date 日付 June 6, 2001
Residence 住所	Settsu-shi, OSAKA 566-8585 JAPAN JPY
Citizenship 国籍	Japanese
Post office address 郵便の宛先	c/o Yodogawa-seisakusho, DAIKIN INDUSTRIES, LTD. 1-1, Nishihitotsuya, Settsu-shi, OSAKA 566-8585 JAPAN
Full name of fourth joint inventor, if any 第四共同発明者名(該当する場合)	Daisuke TANIZAWA
Fourth inventor's signature 第四発明者の署名	Daisuke Tanizawa Date 日付 June 6, 2001
Residence 住所	Settsu-shi, OSAKA 566-8585 JAPAN JPY
Citizenship 国籍	Japanese
Post office address 郵便の宛先	c/o Yodogawa-seisakusho, DAIKIN INDUSTRIES, LTD. 1-1, Nishihitotsuya, Settsu-shi, OSAKA 566-8585 JAPAN
Full name of fifth joint inventor, if any 第五共同発明者名(該当する場合)	Nobuhiko TSUDA
Fifth inventor's signature 第五発明者の署名	Nobuhiko Tsuda Date 日付 June 6, 2001
Residence 住所	Settsu-shi, OSAKA 566-8585 JAPAN
Citizenship 国籍	Japanese JPA
Post office address 郵便の宛先	c/o Yodogawa-seisakusho, DAIKIN INDUSTRIES, LTD. 1-1, Nishihitotsuya, Settsu-shi, OSAKA 566-8585 JAPAN
Full name of sixth joint inventor, if any 第六共同発明者名(該当する場合)	
Sixth inventor's signature 第六発明者の署名	Date 日付
Residence 住所	
Citizenship 国籍	
Post office address 郵便の宛先	